EPIZOOTIOLOGY OF BOVINE BABESIOSIS AND THE CURRENT STATUS OF *BOOPHILUS* ERADICATION IN TEXAS

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General

Babsesiosis (piroplasmosis, tick fever, Texas fever, and redwater) is a tick-borne, febrile disease of domestic and wild animals caused by protozoan parasites of the genus *Babesia.* The parasite enters, multiplies within, and causes extensive destruction of red blood cells resulting in anemia, icterus, hemoglobinuria, and death of the host.

The bovine piroplasmosis eradication program was based on elimination of *Boophilus* ticks as the only vector of the disease in the United States. Once the tick vector was eliminated, young cattle were no longer exposed and, therefore, did not develop acute disease or the chronic carrier state. It was thus unnecessary in this country to depend upon premunition or vaccination, drugs, or serological or other testing procedures.

It was found that *Babesia* spp. were transmitted through the eggs, and the tick larvae were infected; that *Boophilus annulatus* and *B. microplus* were one-host ticks, and for practical purposes had a rather limited host range (cattle, horses and mules, deer and, at least under some circumstances, sheep and goats); and that the vector ticks spend a minimum of 19–21 days on the host and could live off the host only a few months, depending upon environmental factors.

Once these facts were established, the parameters for a tick (and piroplasmosis) eradication program could be laid down. Pastures could be left vacant until all larval ticks died, or host animals could be used to "gather the ticks" and regularly dipped at intervals not exceeding the parasitic period of the tick and over a sufficient period that there were no larvae left to be gathered.

Although the principles of eradication were rather simple, the essential rules had to be rigidly followed, and putting together a successful eradication program required considerable money, manpower, effective dips, cooperation, understanding, and hard work. The technical basis for the program has changed little, except for the permitted pesticide being used.

Early Program Problems and Progress in the United States

Cattle fever ticks *(Boophilus annulatus* and *B. microplus)* and bovine piroplasmosis (*B. bigemina* and *B. argentina*) were endemic in our Southern States more than two centuries ago. Losses from the condition were estimated at $40–$100 million per year when the all-out tick eradication program began in 1906.

Eradication progressed slowly, moving from north to south until reaching central portions of Florida in 1933. It was determined that deer were serving as hosts of *B. microplus* to the extent that their numbers had to be greatly reduced in order to permit successful tick eradication.

The *B. microplus* eradication program on Puerto Rico was successfully completed. Cattle, horses, sheep, and goats were dipped during the systematic program. A small number of deer were eliminated.

Efforts to eradicate *B. microplus* from the U.S. Virgin Islands were not successful. Although the ticks were eliminated by systematic dipping from the islands of St. Thomas and St. John, efforts on St. Croix failed. Deer were believed to be perpetuating the infestation. The Pacific island of Guam is also infested.

Situation Following Eradication

In December 1943, *B. annulatus* and *B. microplus* were considered eradicated from the continental United States, except for a narrow buffer zone in Texas extending 500 miles along the Rio Grande River. Although reinfestations by *Boophilus* spp. carried by animals illegally entering the United States occur regularly, clinical disease rarely results. The buffer area, under Federal and State quarantines, is patrolled to reduce and apprehend the animals moving illegally and prevent further dissemination of the ticks.

The program from 1906 through 1943 cost a total of $40 million. If the program had not been carried out, it is estimated that the present cost of the ticks and disease would be $500 million per year.

Present Situation

During fiscal year 1976, cattle fever ticks (*Boophilus* spp.) were collected from 51 herds of Texas livestock located within the quarantined area along the Rio Grande River and from 84 Texas herds north of this quarantined area. In addition, 149 cattle (41 tick-infested) and 54 horses, smuggled or strayed from Mexico, were apprehended. Forty-four alleged illegal movements and smugglings were reported, with 24 defendants fined by year's end.

Two million cattle and 70,000 horses were inspected for ticks, and 281,000 cattle and 50,000 horses were dipped or sprayed.

During the past decade, livestock production in south Texas has changed considerably, with the cattle population doubling in many areas. This has been due to several factors, including clearing brush and planting improved grasses, more watering tanks, and generally increased rainfall. This has greatly favored survival and spread of ticks.

Additional emphasis was placed on the role of wildlife, particularly whitetailed deer (*Odocoileus virginianus*). Research clearly showed (Florida, 1933) that either *B. annulatus* or *B. microplus* could complete the life cycle on deer. This was further affirmed with *B. microplus* on St. Croix, U.S. Virgin Islands (1962 and 1966) and with *B. annulatus* near Laredo, Texas (1970).

Until recently, there was little reason to believe deer played any significant role in tick eradication in Texas or to consider them in the program. However, there has been a tremendous increase in deer populations, and surveys now underway are revealing that deer may well require more consideration.

Permitted Dips

Under USDA regulations, certain livestock must be dipped in a Department permitted dip prior to their being permitted interstate movement or importation. In addition to having been properly registered and labelled by the Environmental Protection Agency, which includes safety, efficacy, and other requirements, the Food and Drug Administration has certain requirements, including those for tolerances of the pesticide in tissues of dipped animals. Permitted pesticides must meet additional Veterinary Services requirements.

Beaumont crude petroleum was used as an official dip almost exclusively from 1903 until 1910, when the standard arsenical solution was officially recognized. Use of arsenic dip was recently discontinued.

In October 1960, Delnav® was added to the Department's list of permitted dips. In December 1968, coumaphos (Co-Ral®) was added. The most recent addition was toxaphene in July 1972.

No delay between dipping and slaughter is required following use of Delnav® or Co-Ral®.

Dipping certificates are issued to advise interested persons as to the pesticide and concentration used.

Dipping Vat Management

Although the literature includes many papers on the effectiveness of pesticides, it contains comparatively little on formulation or dips and the proper procedure of actually applying the pesticide to the animal. Programs can easily fail because of this.

Acaricide Resistance

Although we have been dipping cattle because of *Boophilus* spp. ticks in the United States for some 85 years, we have never recognized acaricide resistance as being a problem. We attributed the lack of a problem to our steadfast desire to eradicate, not to control, ticks. We used the highest practical concentration of arsenic, not the lowest.

We realize that acaricide resistance is a real and serious problem in many areas of the world.

It is encouraging to know that the Foreign Agriculture Organization is well along in developing a standard test kit to detect acaricide resistance in tick populations.

Research Activities in the United States

Research in the United States for cattle fever ticks has been recently revived. The U.S. Livestock Insects Laboratory (ARS-USDA) at Kerrville, Texas, has established a sublaboratory (Cattle Fever Tick Research Laboratory) at a 30-acre site on a peninsula just below Falcon Dam on the Rio Grande River near Falcon, Texas.

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